2015 DOE SOLID-STATE LIGHTING TECHNOLOGY DEVELOPMENT WORKSHOP

November 17–18, 2015 • Portland Marriott Downtown Waterfront • Portland, OR

Preliminary Workshop Agenda

TUESDAY, NOVEMBER 17

7:00 a.m. *Registration Opens and Continental Breakfast*

TODAY'S LIGHTING PRODUCTS

8:00 a.m. **Welcome and Introduction**

Rapid advances in SSL make it easy to forget that this technology is still at a relatively early stage of development, and much of its potential remains untapped. The advent of SSL has created growing recognition that lighting can fulfill a multiplicity of functions beyond its historically static and unchanging role. Many are embracing this idea, and exploring new product designs and uses that extend beyond simply lighting a space—and offer potential benefits related to health, communications, and data exchange as well as the promise of even greater energy savings. The best is yet to come, and this workshop will explore how we get from here to there.

JAMES BRODRICK, U.S. DEPARTMENT OF ENERGY

8:15 a.m. **Keynote: Tuning the Spectrum for Plant Growth**

The ability to tune the spectrum of LED light sources has opened up new possibilities for horticultural lighting, to improve indoor plant production and associated energy use as well as plant nutrient and pharmaceutical value. This talk will share findings from the Smart Lighting Engineering Research Center's work to examine what we know about the effects of different portions of the spectrum on plant growth, and where future research will focus.

TESSA POCOCK, SMART LIGHTING ENGINEERING RESEARCH CENTER,
RENSSELAER POLYTECHNIC INSTITUTE

9:00 a.m. **LED Market Adoption: Status and Trends**

There's widespread agreement that SSL will eventually become the dominant technology for most lighting applications, but we still have a ways to go before that happens. A new DOE report analyzes the current status of LED adoption and related energy savings in the U.S., while recent analysis in the Pacific Northwest provides some interesting detail on regional lighting product sales. Together the two perspectives provide a picture of the current LED market and how quickly it is changing.

MARY YAMADA, NAVIGANT
ROB CARMICHAEL, CADEO

10:00 a.m. *Refreshment Break*

10:30 a.m. **Lighting System Optimization: Breaking the Old Paradigm**

Market adoption analyses typically look at lighting as a static commodity, but moving away from a one-for-one replacement mindset opens the door to optimized lighting systems that put light only where it is needed. This session will offer varied perspectives from commercial lighting systems experts in the design, property management, and energy efficiency fields to explore how systems thinking can improve lighting quality and increase energy savings.

MODERATOR: RUTH TAYLOR, PACIFIC NORTHWEST NATIONAL LABORATORY
GABE ARNOLD, DESIGNLIGHTS CONSORTIUM
NATE MITTEN, KIMCO REALTY CORPORATION
DANE SANDERS, CLANTON & ASSOCIATES

Noon *Lunch*

1:00 p.m. **Tuning the Spectrum for Health and Productivity**

An increasing number of LED products are coming to market with the promise of health and behavioral benefits. This panel will explore the science behind claims related to productivity and circadian support, separating myth from fact and identifying future research needs.

MODERATOR: NAOMI MILLER, PACIFIC NORTHWEST NATIONAL LABORATORY
GEORGE BRAINARD, JEFFERSON MEDICAL COLLEGE AT THOMAS JEFFERSON UNIVERSITY
STEPHAN VÖLKER, TECHNICAL UNIVERSITY OF BERLIN

2:30 p.m. *Refreshment Break*

3:00 p.m. **Remaining Challenges: LED Street Lighting**

Even though LED streetlights are leading the way in terms of LED lighting adoption, a number of barriers still stand in the way of widespread implementation, including questions about reliability, glare, financing, and ownership. This session will share updates on the challenges facing cities and utilities today as they transition to LED street lighting.

BRUCE KINZEY, PACIFIC NORTHWEST NATIONAL LABORATORY
GLENN HEINMILLER, LAM PARTNERS

4:00 p.m. **Remaining Challenges: Flicker**

The new recommended practice for LED flicker offers guidance to help manufacturers design or select drivers for their products that minimize possible flicker-associated health and productivity effects. This session will offer practical advice on how and when to use the IEEE Standard 1789.

NAOMI MILLER, PACIFIC NORTHWEST NATIONAL LABORATORY
JIM GAINES, PHILIPS LIGHTING

5:00 p.m. **Remaining Challenges: Color Rendering**

TM-30 offers a new system for evaluating color rendition, and this session will provide a hands-on demonstration of how to use TM-30 to get a more complete picture of color rendition and make better choices with LED lighting.

MICHAEL ROYER, PACIFIC NORTHWEST NATIONAL LABORATORY

5:30 p.m. *Networking Reception*

WEDNESDAY, NOVEMBER 18

7:00 a.m. *Continental Breakfast*

TOMORROW'S LIGHTING SYSTEMS

8:00 a.m. **Looking Ahead: The Best Is Yet to Come**

There is widespread agreement that we are in the midst of a sea change in lighting, and that significant SSL technology development headroom remains. But some observers might be wondering why continued improvements in efficacy are needed. With steadily diminishing energy savings returns from each incremental improvement in efficacy, shouldn't we shift our focus to other needed technology improvements? This talk addresses the many expected benefits from continuing to improve SSL efficacy, ranging all the way from reduced materials use to lower product costs.

JAMES BRODRICK, U.S. DEPARTMENT OF ENERGY

8:20 a.m. **The Path to Higher Source, Package, and Product Efficacy**

While LED technical performance has come a long way in a short time, a number of fundamental scientific mysteries—such as "droop" and the "green gap"—continue to limit performance and increase cost. This talk will offer a crash course on current research directions to break down barriers that stand in the way of further improvements in LED product efficacy, performance, and cost.

MORGAN PATTISON, SSLS, INC.

8:40 a.m. **Where Do OLEDs Fit In?**

The advent of the first OLED lighting products at The Home Depot is an indicator that we are starting to see viable OLED products on the market that take advantage of the technology's thin form factor, flexibility, color tunability, and other unique features. Much like the early days of LED lighting, OLED technology is improving fast, and much headroom remains. This talk will offer an update on the status of OLED technology advances, products on the market, and how intelligent design of spaces might include both LED and OLED technology for optimal energy savings.

GIANA PHELAN, OLEDWORKS

9:00 a.m. **The Path to Connected Lighting Systems**

The convergence of intelligent controllable light sources, communication networks, sensors, and data exchange in future lighting systems offers huge potential for energy savings and equally compelling non-energy benefits. This session will recap the discussion from the November 16 Connected Lighting Systems Meeting, also in Portland, where lighting, semiconductor, and IT industry experts will share perspectives on factors that could slow or prevent future connected lighting systems from achieving their full potential.

MICHAEL POPLAWSKI, PACIFIC NORTHWEST NATIONAL LABORATORY
KELLY SANDERS, NORTHWEST ENERGY EFFICIENCY ALLIANCE

10:00 a.m. *Refreshment Break*

10:30 a.m. **LED Life Cycle and Sustainability**

Long life is a hallmark of SSL, but at the same time, the technology continues to change and improve rapidly. Is it really practical to assume products will remain in place, as-is, for 30 years? Surely upgrades will come along, but where does that leave all of those SSL-based lamps, retrofit kits, and luminaires? Can they be designed and manufactured to facilitate recycling and refurbishment? Can current-generation products find new life in other markets? Further, how does the ever-improving efficiency of LEDs impact the overall environmental footprint of SSL? This session will address life cycle sustainability, provide an update on the LED Life Cycle Assessment published by DOE in 2013, and challenge both materials science and life-cycle strategic thinking to further shrink the environmental footprint of SSL.

MODERATOR: KELLY GORDON, PACIFIC NORTHWEST NATIONAL LABORATORY
CHIPS CHIPALKATTI, DR. CHIPS CONSULTING
HEATHER DILLON, UNIVERSITY OF PORTLAND
RACHEL DZOMBAK, UNIVERSITY OF CALIFORNIA, BERKELEY

Noon *Lunch*

1:00 p.m. **How Changing Technology and Business Practices Will Affect the Lighting Industry**

SSL technology is changing the way light is delivered—spurred by changes in technology and business practices outside of the lighting industry. What are the primary reasons manufacturers develop new capabilities with SSL technology, and how does this affect design, manufacturing, and distribution processes? New color-tuning, variable distribution, and power-over-ethernet capabilities are being incorporated into traditional form factors (downlights, troffers, and shoeboxes) that are a common sight in the design and construction industry. So are these new capabilities going unnoticed or causing disruption? This panel will examine several SSL luminaires already delivering change and how this may lead to, or be affected by, larger, imminent changes in design and construction.

MODERATOR: ANDREA WILKERSON, PACIFIC NORTHWEST NATIONAL LABORATORY
CHRIS BAILEY, HUBBELL LIGHTING
DAVE BISBEE, SACRAMENTO MUNICIPAL UTILITY DISTRICT
LORI BROCK, OSRAM SYLVANIA
EDWARD CLARK, ZGF ARCHITECTS
ROB FALLOW, FORTIS CONSTRUCTION
MARK HAND, ACUITY BRANDS
CHIP ISRAEL, LIGHTING DESIGN ALLIANCE
GARY TROTT, CREE

2:30 p.m. *Refreshment Break*

3:00 p.m. ***Continued:*** **How Changing Technology and Business Practices Will Affect the Lighting Industry**

4:30 p.m. *Adjourn*